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IN-VIVO ANTIFUNGAL ACTIVITY OF THE AERIAL PART OF *ANVILLEA RADIATA* BY USING A NEW METHOD OF STORAGE BY COATING GRAIN

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ABSTRACT: The aim of the present study is to evaluate the antifungal effect of *Anvillea radiata* and to test the storage efficiency of soft wheat by coating. Phytochemical screening conducted on the *Anvillea radiata* extracts revealed the presence of the elements has known medical and physiological activities. Our results show a correlation between the plant part, extract concentrations and mold species. In general, all the sensitivity curves show an increasing trend with more or less steep slopes depending on the mold strains and concentration. This action makes it possible to use the method of storage soft wheat by coating grains for increases the storage time and reduces the risk of alteration by mold.

INTRODUCTION: According to (ONFAA, 2016) [1], Imports of soft wheat reached 976884 tons (199.6 million USD) in the first two months of 2016 compared with 907014 tons (209.6 million USD) in the same period of last year (an increase 7.7% in tones and a decrease of 4.77% in USD). Therefore Algeria among the first importer of soft wheat. The alteration of cereals during storage has been widely studied in the literature. Fungi contamination is one of the main causes of deterioration of cereal grains [2].

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In our work we will use an Algerian plant *Anvillea radiata* for a new method of storage by coating. *Anvillea radiata* Saharan endemic plant [3] of the family Asteraceae have hermaphrodite or unisexual flowers with an actinomorphous corolla which is in the form of tubulated flowers, and giving a fruit called akene which is provided with a pappus.

FIG. 1: *ANVILLEA RADIATA* (SOURCE, 2014)

According to the Algerian tradition, infusion of leaves and stems is used in the treatment of bronchopulmonary pathologies [3, 4] and digestive diseases [3, 5]. Shoots of *Anvillea radiata*, in cold or hot infusion, are used as a cure for diabetes [4, 5].

MATERIALS AND METHODS:

Sampling and Identification of Plant: The aerial parts *Anvillea radiata* were harvested on the site the south western part of Algeria in April to June in 2014, at cordinate (32°15'19.4"N ; 0° 06' 01.4"W) and (32°01' 54.7"N ; 0° 24' 40.0"W). They were identified at the Laboratory of Plants' Resources and Food Security in Semi-arid Areas, South-West of Algeria, University of Bechar - BP 417, Bechar (08000), Algeria. These plants were cleaned, dried and then pulverized to give fine powders.

Phytochemical Screening:

TABLE 1: CHARACTERIZATION THE MAIN CHEMICAL COMPONENTS IN THE PLANT BY COLOURED REACTIONS [6, 7]

Chemical components	Coloured reactions
Alkaloids	Reagents of Dra-gendroff and Mayer
Flavonoids	Reaction of cyanidine
Saponosids	Foam index
Tannins	Ferric chlorides
Reducing compounds	Reagent of Fehling
Sterols and terpens	Reagents of Liebermann Buchard

Preparation of plant extract: 300g of the aerial part of plant were added hydro methanol (v / 3v). By using a Soxlhet apparatus according to the method recommended by the French pharmacopoeia. All the solvent was evaporated with Rotavapor and the total methanolic extracts obtained were used to prepare concentration solutions.

Sampling, Isolation and identification of soft wheat molds: 20 Samples of imported soft wheat in 2008 to 2012 were then transported to the Laboratory of Plants' Resources and Food Security in Semi-arid Areas, South-West of Algeria, University of Bechar - BP 417, Bechar (08000), Algeria. Were stored in a chamber at 25 °C. Before being analyzed.

10 sterile petri dishes containing sterile filter paper, impregnated with 5 ml NaCl in which 100 randomly selected grains of each sample are placed[8]. On reading the results, a contaminated grain is differentiated from an uncontaminated grain.

Aspergillus flavus, *Aspergillus ochraceus*, *Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus parasiticus*, *Fusarium sp* and *Penicillium sp* eight strains were isolated from french imported soft wheat by Pr. Moussaoui responsible of Laboratory of Plants' Resources and Food Security in Semi-arid Areas, South-West of Algeria, University of Bechar - BP 417, Bechar (08000), Algeria.

Evaluation of Antifungal Activity: Antifungal tests are performed according to the method reported by Thomas *et al*., (2012)[9]. Standard drug was prepared by dissolving 1mg of crude extract in 1ml of DMSO (1:1) for both the plants[10].The final concentrations in extracts are 1/100, 1/250, 1/500, 1/1000, 1/5000 (v / v). Controls were also prepared containing the culture medium and the 0.2% agar solution alone. Each test is repeated three times. The results obtained are expressed as percent inhibition [11].

Testing storage method by coating for Antifungal activity: The test is carried out as follows; The wheat is moistened with the extract of the plants used to coat the grains with substances of the plant. The wheat is then dried and stored in the flasks; Each bottle contains 1 kg of soft wheat.

The effectiveness of these methods is evaluated by post-drying and post-storage analyzes after one year of storage with a one-year period from March 2015 to March 2016. Mycological analyzes are identical to the previous.

RESULTS AND DISCUSSION:

Phytochemical Screening: The phytochemical screening of *Anvillea radiata* is shown in **Table 2**.

TABLE 2: PHYTOCHEMICAL SCREENING OF AERIAL PARTS OF *ANVILLEA RADIATA*

Chemical components	Results
Alkaloids	+
Flavonoids	+
Saponins	+
Tannins	+
Reducing compounds	+/-
Sterols and terpens	+

Key: (+) Present; (-) Absent; (+/-) low presence

The phytochemical results obtained show a heterogeneity of chemical groups. However, the presence flavonoids, sterols, saponins, anthroquinones and cardiac glycosides in the plant extracts such as bioactive [12]. This components has known medical and physiological activities [3].

Antifungal activity: The antifungal activity of plants extract was given in the **Fig. 1**. The antifungal activity of the extracts of the plants obtained was evaluated by the diffusion method in agar medium.

Our results show a correlation between the plant part, extract concentrations and mold species. In general, all the sensitivity curves show an increasing trend with more or less steep slopes depending on the mold strains and concentration.

Molds showed increased sensitivity to increasing the concentration of extracts in their culture medium. Where the diameter of the colony is reduced whenever the dose of the extract is increased. This may justify certain therapeutic uses of this plant in traditional medicine. According to Askarne *et al.*, (2012) [13].

He proved that *Anvillea radiata* and *Thymus leptobotrys* plants completely inhibited mycelial growth of *Penicillium italicum.* Previous studies indicate that flavonoids of several plant extracts showed antifungal activities [14].

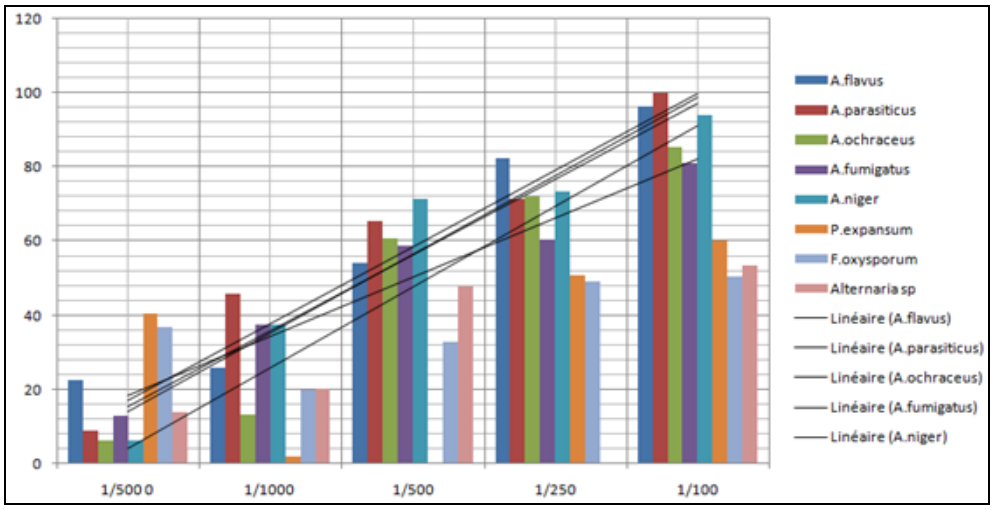

FIG. 2: RESULTS RELATED TO THE GROWTH OF THE MOLDS STUDIED SUBJECTED TO THE ACTION OF THE DIFFERENT CONCENTRATIONS OF THE EXTRACTS TESTED OF *ANVILLEA RADIATA* ARE ILLUSTRATED IN GRAPHS

Storage Method by Coating for Antifungal Activity: In comparison with the witness; the storage by coating of wheat grain with the extract decreases the frequency of contamination in a more or less important way. It was marked excellent anti-fungal effect. The *Anvillea radiata* plant showed more efficacy for Aspergillus with a difference of 9.48%.

In general, antifungal therapies using flavonoids, the saponosides, the tanins and terpenes and their derivative [15]. The compounds detected by phytochemical tests. All these were previously reported by Mohammed *et al.*, 2014 [16]. It is the presence of these chemical compounds groups which certainly reinforces the therapeutic virtues of this plant[17] (**Fig. 3, 4**).

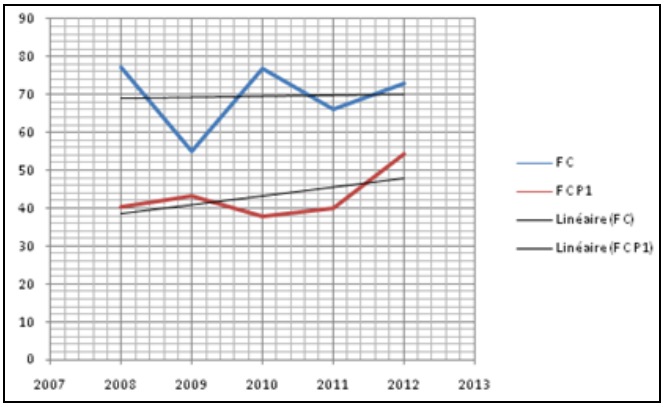

FIG. 3: RESULTS RELATING TO THE FREQUENCY OF CONTAMINATION OF THE MOLDS STUDIED SUBJECTED TO THE ACTION OF THE AQUEOUS EXTRACTS (FC: frequency of contamination without the addition of the Control extract, FCP1: frequency of contamination with the addition of extracts of *Anvillea radiata)*

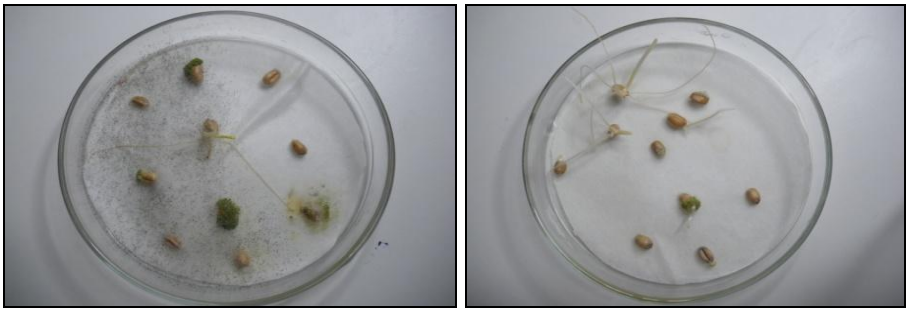

FIG. 4: RESULTS RELATED TO THE CONTAMINATION OF SOFT WHEAT GRAIN BY MOLD (Right: contamination frequency without addition of control extract, left: contamination of wheat grain with molds and coating of *Anvillea radiata* extracts)

CONCLUSION: We also noticed that our extracts significantly inhibited growth mycelium growth compared to controls. According to these results we can predict that our plant is an effective natural antifungal and can be a very important source of plant protection constituents used to eradicate infections of fungal origin. This plant also increases the efficiency of the method of storage by coating.

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CONFLICTS OF INTEREST: Nil.

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